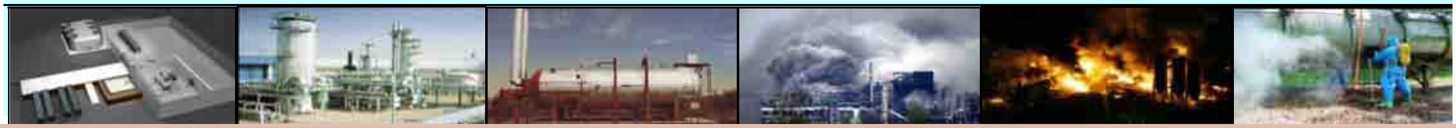
Clean Air Act 112(r) Risk Management Program (RMP) SPCC/FRP EPCRA

CHEMICAL EMERGENCY PREVENTION & PLANNING Newsletter



November-December 2008 US EPA Region 10

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CHEMICAL EMERGENCY PREVENTION & PLANNING *Newsletter*

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Agricultural Ammonia

RMP Training

RMP Guidance

RMP Training for Industry Groups

EPA's Risk Management Program is looking for new opportunities to provide compliance training to your industry. In the past we have provided 1-day seminars to the regulated community that covered the Risk Management Plan and Program requirements for many different types of facilities.

Our new focus is to reach out to specific types of facilities through industry groups (see following article - **Far West**). This allows us to give more specific and in-depth guidance. If you belong to an association whose members are regulated under the Risk Management Program, EPA would be very interested in attending the meetings to provide compliance information to your members.

Contact Javier Morales at: morales.javier@epa.gov

Retail Ammonia RMP Training. Far West Agribusiness Association's 2008 Winter Conference will be held December 9-10 in Kennewick, WA. This is an annual event that brings together people from across the fertilizer and agrichemical industry in the northwest.

EPA staff will attend to present information on the Risk Management Program as it applies to agricultural ammonia facilities.

For more information and to register, go to: www.fwaa.org and click on Washington Winter Conference.

Retail Ammonia Guidance Documents The ***my*RMP** Suite of Retail Guidance Materials is sponsored by The Fertilizer Institute and was developed cooperatively with the Asmark Institute. Available for free, this industry-specific guidance is supported by U.S. EPA.

Links to this guidance and preparation tips for an RMP Inspection can be found on our website:
http://yosemite.epa.gov/R10/CLEANUP.NSF/sites/rmp

- Or find myRMP at the Asmark website:
http://www.asmark.org/myrmp/suite.shtml

Feature

Ammonia Refrigeration Plant

The toxic, fire and explosion hazards present in refrigeration systems containing ammonia are most likely to be found at cold storage and food distribution warehouses. Hazards apply to the entire system not simply the compressor house.

There have been some explosions involving ammonia. Most of the reported incidents involved ammonia leakage from a refrigeration plant due to poor preventive maintenance.

PRESSURE VESSELS

- **Potential Hazards:**

  Release of ammonia as a result of vessel failure due to:
  - Improper design and installation (this can include improperly designed relief devices).
  - Thermal expansion or contraction.
  - Corrosion.
  - Overfilling.
  - External damage (for example, from a forklift).

- **Possible Controls:**

1) Identify and provide information to facility staff pertaining to the hazards of ammonia.
2) Design and install receiving/storage vessels according to generally accepted good engineering practices.
   - Ensure that Safety Relief Valves and relief systems for storage vessels are properly designed, installed in vapor space, and discharged to a safe location.
   - Place barriers around receiving and storage vessels and other equipment to protect them from impact.
3) Conduct a process hazard analysis.
4) Develop and utilize Operating Procedures to ensure proper operation of vessel(s).
5) Provide training specific to receivers and storage vessels.
6) Conduct pre-startup safety review prior to introducing ammonia when the equipment is new or modified significantly enough to require a change in the process safety information.

Ammonia Refrigeration Compressor

Pressure Vessel

7) Routinely inspect the receiving and storage vessel for corrosion as part of a Mechanical Integrity Program.
   - Develop written procedures to manually remove oil from equipment.
   - Maintenance for pressure vessels should include the following tasks performed on a weekly basis (reference: IIAR Bulletin No. 110):
     - Check liquid level gauges for oil build up and drain if necessary.
     - Drain oil from vessel (only on vessels where the opportunity for continuous entrance of oil exists). Some systems will be equipped with an automated oil recovery scheme. For those systems it is not necessary to manually drain oil from the various vessels. It is however necessary that you periodically verify that the automated oil recovery system is functioning properly.
     - Inspect vessel and insulation for external appearance and note any departures from

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normal appearance in the system log. The conditions under insulated portions of the system should be inspected on a periodic basis.

- Purge vessel of non-condensable gases. For those systems which operate under positive pressure, non-condensable gases are typically introduced during improper maintenance (failure to evacuate after opening the system) or improper charging procedures.

❖ Ensure that draining and venting plugs, caps, and blind flanges are in place and closed.

❖ Always pressure test any portion of the system opened for maintenance and before evacuation.

8) Issue a hot work permit for hot work operations conducted on or near the storage vessel.

9) Establish and implement written procedures to manage changes to equipment, procedures, and facilities.

10) Investigate incidents and near misses that could have resulted in a release of ammonia.

11) Establish and test an emergency action or emergency response plan in case of release.

HOSES FOR RECEIVING AND STORAGE OF AMMONIA

Hoses used for loading or unloading ammonia into or from the refrigeration system have a limited life. The user must be alert to signs of hose deterioration before failure occurs.

Ammonia Hose

- **Potential Hazards:**
  - ➢ **Hose failure, leading to a release of ammonia.**

- **Possible Controls:**

1) Provide information pertaining to the hazards of ammonia to workers.

2) Use hoses that are designed according to generally accepted good engineering practices.
   - ❖ Use hoses that are commonly used for ammonia such as stainless steel braided or nylon braided hoses.
   - ❖ Replace hoses according to the manufacturers' recommendations.
   - ❖ Do not use old, damaged, or mistreated hoses.

3) Ensure employees are trained in the proper care and maintenance of hoses.

4) Conduct routine inspections or testing for hoses as part of a Mechanical Integrity Program.
   - ❖ Inspect hoses and connectors prior to each use. Look for loose covers, kinks, soft spots.
   - ❖ Perform a hydrostatic test periodically.
   - ❖ Inspect the couplings or fittings.

AMMONIA LOADING AND UNLOADING OPERATIONS

Ammonia is delivered by an outside source, such as a rail car, over-the-road tank car, or cylinder. Pumps, compressors, or simply differential pressure is used to transfer the ammonia to the storage vessels (or other portions of the system).

Loading Rack for Ammonia Storage Tank

Unloading Ammonia from a Railcar

- **Potential Hazards:**
  - ➢ **Release of ammonia during loading and unloading operations.**

- **Possible Controls:**

1) Provide employees with information pertaining to the hazards of ammonia.

2) Conduct a process hazard analysis on the loading/unloading process.

3) Develop and implement written standard

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operating procedures (SOP) for loading the storage vessel.

- Use wheel chocks to prevent the vehicle from moving during unloading operations.
- Wear appropriate Personal Protective Equipment (PPE) while connecting, disconnecting, and venting the transfer hose.
- Never leave the charging operation unattended.

4) Ensure employees are trained in the loading process.

Do not overfill the vessel during loading. Check the level measurement device on the storage tank to ensure adequate storage space to receive the ammonia before starting unloading operations.

References for Ammonia Refrigeration Evaluation

An effective process safety management program requires a systematic approach to evaluating the whole chemical process. The following references aid in evaluating process hazards in the workplace.

- ***General Risk Management Program Guidance. Environmental Protection Agency (EPA), (2004).***
  Contains an updated risk management program, which includes an appendix specifically addressing ammonia refrigeration facilities. While this guidance is primarily designed to assist with the development and implementation of a risk management plan as required by the EPA, much of the information can also be used by those who are required to comply with the OSHA Process Safety Management Standard (29 CFR 1910.119).

- ***Process Safety Management Guidelines. International Institute of Ammonia Refrigeration (IIAR), (1998).***
  Provides guidance on the interpretation and implementation of OSHA Process Safety Management Standard. Contains a chapter discussing each of the fourteen elements and includes a series of work practices, checklists, and other guidance materials to assist employers in developing a Process Safety Management program.

- **Appendix E: Supplemental Risk Management Program Guidance for Ammonia Refrigeration Facilities. Environmental Protection Agency (EPA), (2004).**
  This appendix replaces the former stand-alone document "Risk Management Program Guidance for Ammonia Refrigeration." This appendix is intended for facilities with ammonia refrigeration systems (e.g., food processors and distributors, refrigerated warehouses). It covers only anhydrous ammonia and provides offsite consequence analyses that are specific to the ways in which ammonia is handled in an ammonia refrigeration system.

- Properly connect and disconnect hoses.
- Properly empty and vent hoses and pressure relief valves before disconnecting.
- Ensure proper handling, stowing, and care of hoses.
- Do not stand in line with ammonia discharge while venting pressure relief devices and hoses.
- Disconnect and secure both ends of the hoses before moving the tank truck.
- When loading from cylinders:
  - Properly connect and disconnect lines.
  - Properly empty and vent lines before disconnecting.
  - Properly secure cylinders.
- Use bleeder valves to ensure that there is minimal vapor (no positive pressure) and no liquid ammonia in the hoses before disconnecting.

5) Investigate accidents and near misses that could have resulted in a release of ammonia.

STANDARD SHUTDOWN OPERATIONS

Once the transfer is complete, workers must perform standard shutdown operations to turn off the pumps/compressors, and disconnect the hoses.

- Potential Hazards:
  Release of ammonia as a result of improper procedures associated with:
  - Opening and draining process equipment.
  - Locking out equipment for maintenance.
  - Blocking liquid ammonia lines and equipment; this is particularly important for equipment which contains ammonia liquid that is below ambient temperature.

Possible Controls:

1) Provide ammonia relief systems designed and installed according to generally accepted good engineering practices.

2) Provide written procedures and training for lockout/tagout, opening and draining process equipment, and blocking liquid ammonia lines.

3) Investigate accidents and near misses that could have resulted in a release of ammonia.

4) Establish and implement an emergency action plan in case of release.

(Source: OSHA)

Ammonia Pressure Vessel Incidents

Absence of Relief Valve caused Catastrophic Vessel Failure

On April 11, 2003, vessel explosion at the D. D. Williamson & Co., Inc. plant in Kentucky killed one operator. The explosion damaged the western end of the facility and released 26,000 pounds of aqua ammonia, forcing the evacuation of as many as 26 residents and requiring 1,500 people to shelter-in-place.

The facility used the vessel as a feed tank in the manufacture of food-grade caramel coloring. The feed tank, which was heated with steam and pressurized with air, was operated manually. Hence, to ensure that the filling, heating, and material transfer processes stayed within operating limits, operators relied on their experience and on readouts from local temperature and pressure indicators. The feed tank most likely failed as a result of overheating the caramel color liquid, which generated excessive pressure. The tank had no relief device for overpressure protection, nor did it have basic process control or alarm instrumentation to prevent process upsets. The top head of the feed tank separated at the weld seam and was propelled approximately 100 yards. A portion of the feed tank struck an aqua ammonia storage tank, located 15 feet away and outside the feed tank area. The aqua ammonia storage tank was knocked off its foundation and piping was ripped loose, which resulted in the 26,000-pound aqua ammonia leak. An ammonia vapor cloud drifted toward neighboring homes.

In investigating this incident, it was found that:

1) The tank that failed had no relief device, nor did it have basic process instrumentation to control or monitor process upsets.
2) The facility had no program for evaluating the mechanical integrity of the vessel for service.
3) The facility did not have adequate hazard analysis systems to identify feed tank hazards.

(Source: Chemical Safety Board)

Corrosion caused Rupture of Anhydrous Ammonia Tank

On June 6, 2005, an internal non-code weld had weakened the shell of an anhydrous ammonia nurse tank causing the tank to rupture. The incident released approximately 841 gallons of anhydrous ammonia to the atmosphere.

The full, pressurized tank (125 psi) was propelled across the facility yard narrowly missing bulk agricultural chemical tanks and buildings as it flew. The tank came to rest approximately 250 feet away after first splitting a tractor in half. An extensive cloud of ammonia vapor drifted away from all major populated areas although some nearby residents were treated for exposure. This tank was manufactured in 1973.

A weakened section around the tank shell welded area was the likely cause of the nurse tank rupture. The periodic inspection or hydrotest of this pressure vessel would have prevented this incident. Prior to the incident, an employee filled the subject nurse tank to 85 percent capacity with anhydrous ammonia. The nurse tank exploded after about 3 hours later. No employees or customers were on site.

(Source: Process Safety Beacon)

Anhydrous Ammonia pumped into Propane Storage Tanks

On October 21, 1999, two 30,000-gallon propane tanks, each at seventy percent capacity were accidentally topped off with anhydrous ammonia. Similar plumbing on both transport and storage tanks made the transfer possible.

The galvanized fittings on the propane tanks would have corroded through causing the release of ammonia and propane if not immediately emptied. Compounding the problem, the individual pressures of ammonia and propane together in a tank are additive which would have caused pressure relief valves to open when the internal tank temperature reached 70°F.
(Source: Process Safety Beacon)

Hazards of Ammonia

Ammonia is considered a high health hazard because it is corrosive to the skin, eyes, and lungs. Exposure to 300 ppm is immediately dangerous to life and health. If the possibility of exposure above 300 ppm exists, use a NIOSH approved self-contained breathing apparatus with a full facepiece operated in a pressure-demand or other positive-pressure mode. Ammonia is also flammable at concentrations of approximately 15 to 28% by volume in air. When mixed with lubricating oils, its flammable concentration range is increased. It can explode if released in an enclosed space with a source of ignition present, or if a vessel containing anhydrous ammonia is exposed to fire.

Ammonia Piping Incidents

- In a cold storage facility, oil pressure got low over a long weekend in an ammonia refrigeration system. The low oil pressure cut-out switch failed to stop the compressor. The compressor continued running without adequate lubricating oil and tore itself apart. It resulted in a significant ammonia release. The **periodic calibration of the low oil pressure cut-out switch** to assure its integrity would have prevented this incident.

- In a packing plant slaughterhouse, a refrigeration line ruptured, releasing ammonia. Eight workers were critically injured, suffering respiratory burns from ammonia inhalation. The **periodic inspection or hydrotest of piping** would have prevented this incident.

- An ammonia release in a frozen pizza plant led to the evacuation of nearly all of the 6,500 residents of the town where the plant was located. The release started when an end cap of a 16-inch suction line of the refrigeration system was knocked off. Up to 45,000 pounds of ammonia was released, forming a cloud 24 city blocks long. About 50 area residents were taken to hospitals while dozens of others were treated at evacuation centers. The **periodic inspection or hydrotest of piping** would have prevented this incident.

- A specific incident demonstrates the need for mechanical protection to protect refrigeration equipment from impact. In an incident at a meat packing plant, a forklift struck and ruptured a pipe carrying ammonia for refrigeration. Workers were evacuated when the leak was detected. A short time later, an explosion occurred that caused extensive damage, including large holes in two sides of the building. The forklift was believed to be the source of ignition. In this incident, **physical barriers** would have provided mechanical protection to the refrigeration system and prevented a release.

- During unloading of ammonia to a storage unit, a hose ruptured releasing 2,870 pounds of ammonia into the air. Three persons were taken to the hospital with respiratory distress and fifteen acres of crops were destroyed. The **periodic inspection or hydrotest of the hoses** would have prevented this incident. Hoses have a limited life. The user must be alert to signs of hose deterioration before failure occurs.

Ammonia Plant Self-Inspection Checklist

Ammonia Plant Safety – Self Inspection Checklist	Yes	No	N/A
1. Are all employees properly trained?			
2. Are all personnel assigned to work with anhydrous ammonia capable of working in a hazardous area?			
3. Are goggles used by all persons handling anhydrous ammonia?			
4. Are ammonia-resistant gloves used by all persons handling anhydrous ammonia?			
5. Is a safety water tank or an approved deluge shower available?			
6. Is a "First Aid Water" decal on the safety tank or shower?			
7. Are rain suits or slickers available?			
8. Are boots available?			
9. Are two fullface masks available?			
10. Are canisters current?			
11. Are two self-contained air masks available for emergencies?			
12. Are safety belts and life lines available?			
13. Is an approved first aid kit available?			
14. Are fire extinguishers in good condition?			
15. Have the local emergency authorities been trained in handling anhydrous ammonia emergencies?			
16. Are emergency telephone numbers conspicuously posted?			
17. Are storage tanks approved for anhydrous ammonia?			
18. Is the paint on storage tanks in good condition?			
19. Are the "Caution-Ammonia" or "Anhydrous Ammonia" decals in place?			
20. Are the "Warnings" and "First Aid" decals in place?			
21. Are "Wear Your Goggles" decals located throughout the work area?			
22. Are all valves, and like equipment, approved for anhydrous ammonia?			
23. Are the liquid and vapor valves properly identified?			
24. Are excess flow checks in all openings where required?			
25. Are relief valves checked and replaced regularly?			
26. Are all relief valves capped?			
27. Is all piping done with schedule 80, black pipe (no galvanized or brass)?			
28. Are all hoses labeled for anhydrous ammonia?			
29. Are all hoses and pipes equipped with relief valves where needed?			
30. Are hoses inspected regularly and changed when age or condition require?			
31. Are transfer connection areas (transport stubs, loading stations, and so on) marked "Caution-Ammonia" or "Anhydrous Ammonia"?			
32. Is there an automatic backcheck in the transport liquid line?			
33. Are wheel chocks for nurse tanks, motor transports, and rail cars available?			
34. Are "Stop-Tank Car Connected" signs available and in use?			
35. Is the site clean and well kept?			

Source: OSHA

Safety Alert

Flammables and Static Electricity

A customer was filling an ungrounded gasoline can in the cargo area of a truck when the vapors were ignited by a static electric discharge. The fire caused severe damage to the truck and the gasoline station. The customer suffered severe burns on both legs, and it could have been much worse if four bystanders had not managed to extinguish the flames using their own clothing.

This incident reminds us of the consequences of failing to recognize static electric ignition hazards of containers, piping, and any equipment used to handle flammable and combustible liquids or gases, combustible mists, or combustible dusts.

Never have ungrounded conductive parts in a system handling flammables!

The pictures above show some examples of good grounding and bonding practices.

Did you know?

- Static electric charges on material, equipment, and people result from materials contacting each other and then being separated. Electric charge can transfer from one of the materials to the other, and this charge will build up if it cannot flow to ground.
- Solids or liquid drops falling through air can create static charges on the solids or drops.
- Static electric discharges can be sufficiently energetic to ignite a flammable atmosphere – for example the vapors from a flammable liquid or a combustible dust cloud.
- The first defense against static ignition is to eliminate the flammable atmosphere if possible. If this is not possible, it is important to prevent and control electrostatic charge accumulation.
- Bonding means that conductive parts of equipment are connected to each other so there can be no electric discharges between the parts.
- Grounding means that conductive parts of equipment are connected to an electrical ground, allowing electric discharges to ground.

What can you do?

- Always ground conductive containers – drums, pails, portable tanks, tank trucks, railroad cars, and any other vessels - when transferring flammable or combustible materials.
- Make sure that process equipment is properly grounded, and that grounding is periodically tested.
- Minimize free fall of solids or liquids through the air when filling vessels and containers.
- If you do maintenance on equipment, make sure that all grounding connections are properly replaced and tested following the maintenance.
- If you work in an area that requires special procedures to prevent static discharge – for example, special shoes or clothing or use of other special equipment – be sure to understand and follow all procedures.

(Source: Process Safety Beacon)